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OPTIONS TO ENHANCE ENERGY EFFICIENCY AND SECURITY OF GAS SUPPLY TO EUROPE USING AVAILABLE INFRASTRUCTURE IN UKRAINE

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“GAZPROM WATCHING UKRAINE’S GAS STORAGE ”

UPI March 25, 2010

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Alexei Miller said that Ukrainian utility Naftogaz had taken less gas than was required in the current gas contract during the first quarter of 2010.

Gazprom, he said, was concerned that slumping volumes in Ukraine's underground gas storage facilities would create energy issues (*gas supply to EU*) for the winter.

"We should proceed from the fact that Naftogaz has to replenish its UGS facilities with the required gas volumes by the beginning of the 2010-11 autumn-winter period in order to smoothly overcome this peak load period," he said.

EU PARLIAMENT RESOLUTION ON UKRAINE

25 February 2010

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- Calls on the Commission to provide the necessary technical assistance in order to improve radically the energy efficiency of Ukraine electricity grid and
- Calls to step up cooperation as regards reform of the gas sector in order to bring in into line with EU standards;
- Asks for consistent European support for Ukrainian strategy to reduce energy consumption and to increase energy efficiency as the best way reduce spending on gas and its dependency on energy imports.

DISASTER IN THE CITY OF ALCHEVSK

The 2006 Gas Crisis

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22 January

At 13 hours the city's main district heating pipe brakes. All boilers in station "East" stop. The heat supply to administrative, commercial and residential buildings in the Eastern part of the city is cut off while the temperature outside is -30C.

23 January

In the Western part of the city, accidentally pierced cutting the electricity supply to the boiler station "West" The "West" boiler room stops work. 90,000 people affected. The Mayor of Alchevsk declares regional state of emergency –

25 января на ликвидации аварии работало в общей сложности 110 бригад (звеньев). Распределением их по домам непосредственно занимались ЖЭКи.

К концу 25-го января тепло отсутствовало в 294-х домах в восточной части города, в 223-х – в западной. Итого – в 517-ти домах из 836-ти. Ситуация заместителем министра названа катастрофической. Ещё более усугубляет положение неизвестность о характере повреждений внутридомовых сетей.

3 марта Сегодня вечером, в результате отключения электроэнергии на котельной "Восточная" вновь остановился котел, обогревающий половину города. Как сообщила оперативная группа газеты "За металл", выехавшая на место аварии, причин для беспокойства нет. Питание котла электроэнергией уже восстановлено, и котел выходит на свою рабочую мощность.

Пока что батареи в домах остаются едва теплыми, но уже утром отопление будет в норме

CONTENTS

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- Introduction to Ukraine energy system & usage
- Seasonal and intra-seasonal peak demand for heat
- Reliability of electricity supply
- Impact on security of gas transit
- Implications, Recommendations and Outcomes

INTRODUCTION TO UKRAINE ENERGY SYSTEM*

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- **Natural gas transit system**
 - Underground storages
 - Domestic gas production
 - Compressors
- **Electricity generation**
 - Nuclear power plants
 - Thermal power plants
 - Hydro power plants
- **Heating systems**
 - District & central heating
 - Space heating in industry

With exception of some hydro power plants, all elements of this energy system are dependent on natural gas supply in one or another way

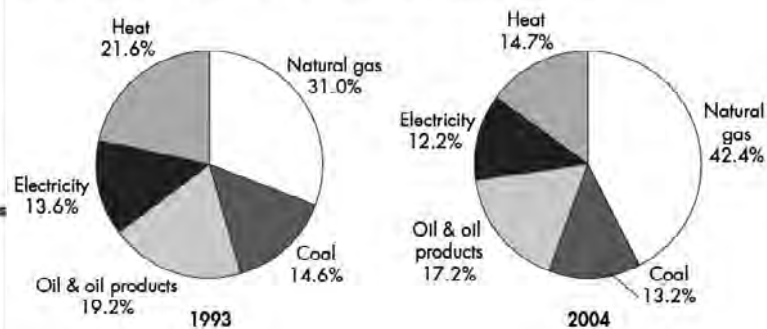
*Excluding crude oil & natural gas upstream activities; crude oil transit, refining and use; ammonia transit; biomass and fuel wood.

Ukrainian Power Network



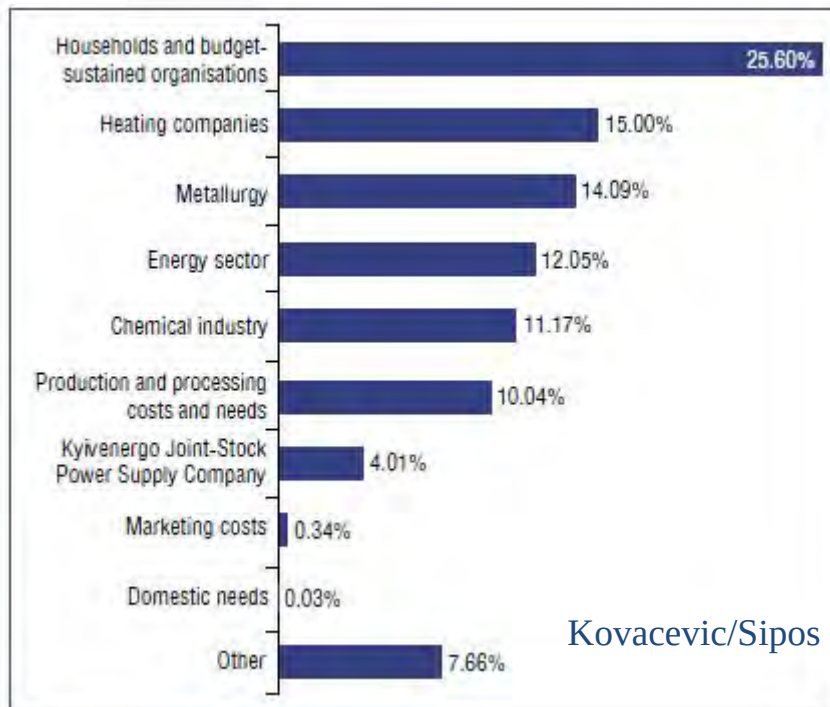
Source: EBRD.

Total Final Energy Consumption by Fuel, 1993 and 2004



Source: IEA statistics.

Gas Supply and Transit via Ukrainian Entry/Exit Points during 2004-2008 (bcm)

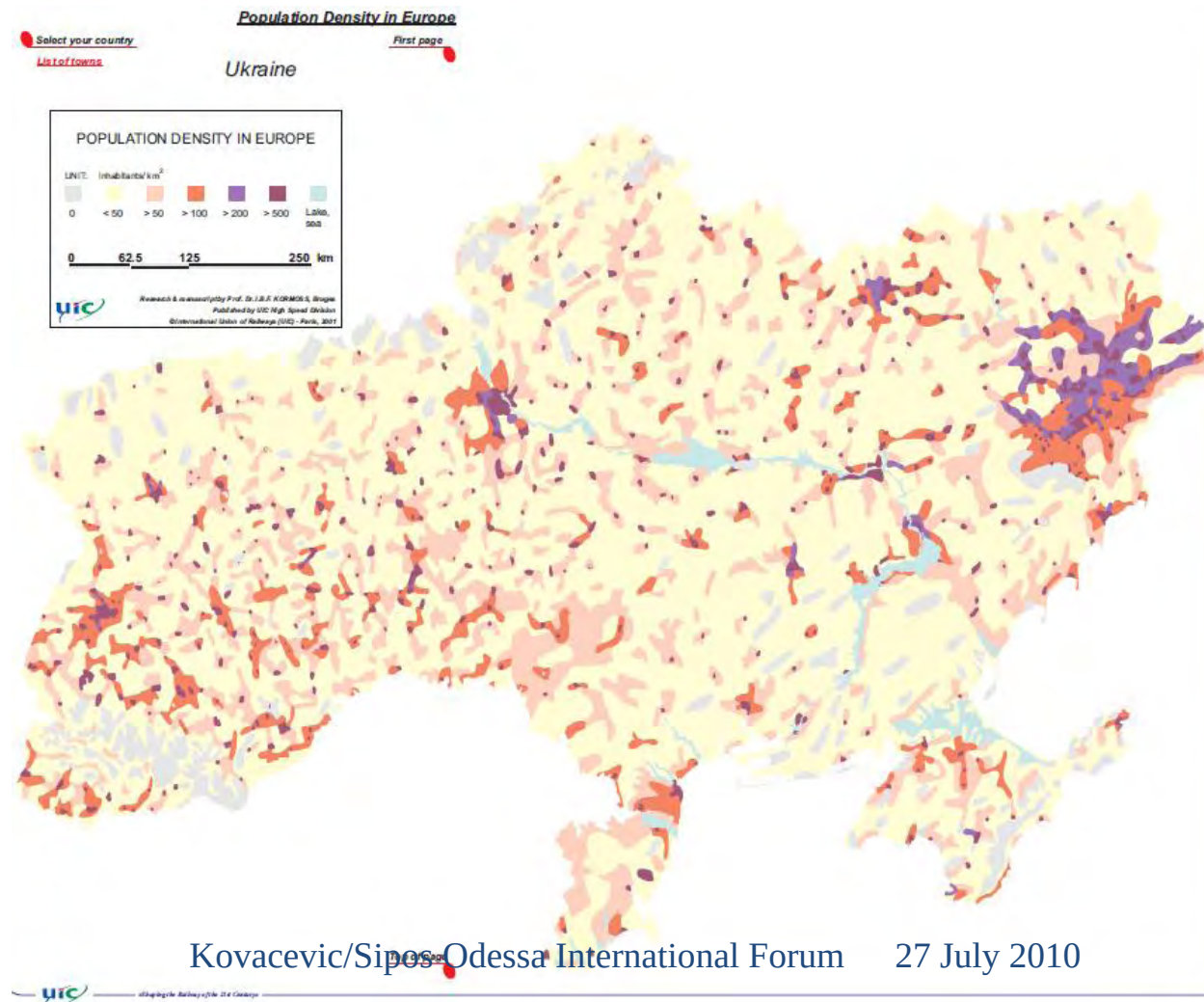


Kovacevic/Sipos Odesa International Forum

27 July 2010

GEOGRAPHICAL CONCENTRATION GAS/ENERGY DEMAND AND POPULATION DENSITY

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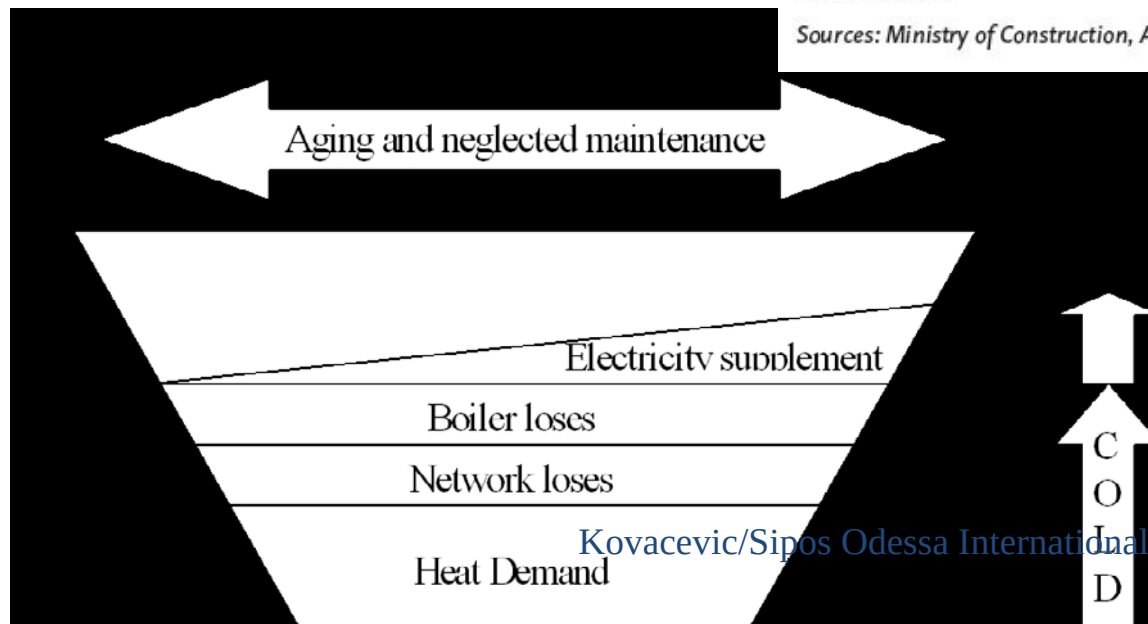
THE PEAK HEAT DEMAND IN COLD WEATHER

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Energy Losses in District Heating Systems Operated on Natural Gas (%)

	Current average losses	Level of losses after technologically possible efficiency improvements
Heat production	22.0	14.5
Heat transportation	25.0	13.0
Heat exchangers	5.0	2.0
Final use	30.0	10.0
Total losses	60.0	38.0

Sources: Ministry of Construction, Architecture, Housing and Communal Services.



ELECTRICITY GENERATION IN THERMAL POWER PLANTS

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- Very low load factor: about 28% i.e. below 3000 hours implies:
 - ▣ Seasonal focus and high outage probability that make security of heat supply a critical problem:
 - Many plants are used in CHP mode providing also heat to local district heating networks
 - Coal fired units use natural gas for starts and supplement

THE ROLE OF GAS FIRED STEAM CYCLE POWER PLANTS IN ELECTRICITY GENERATION

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- Maintaining integrity of the electricity generation (voltage, frequency)
 - ▣ In case of cold weather and peak heat demand or in case of technical outage available hydro capacity is of minimal help since there is minor hydro accumulation capacity and heat demand can not be covered
 - ▣ Gas fired generators provide rapid thermal reserve capacity.

ZAPORJSKAIA THERMAL POWER PLANT

4x300MWe (coal) + 3x800MWe (gas)

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Gas fired electricity generation is embedded into existing coal fired power plants in form of very large (800MWe!) gas fired steam cycle units



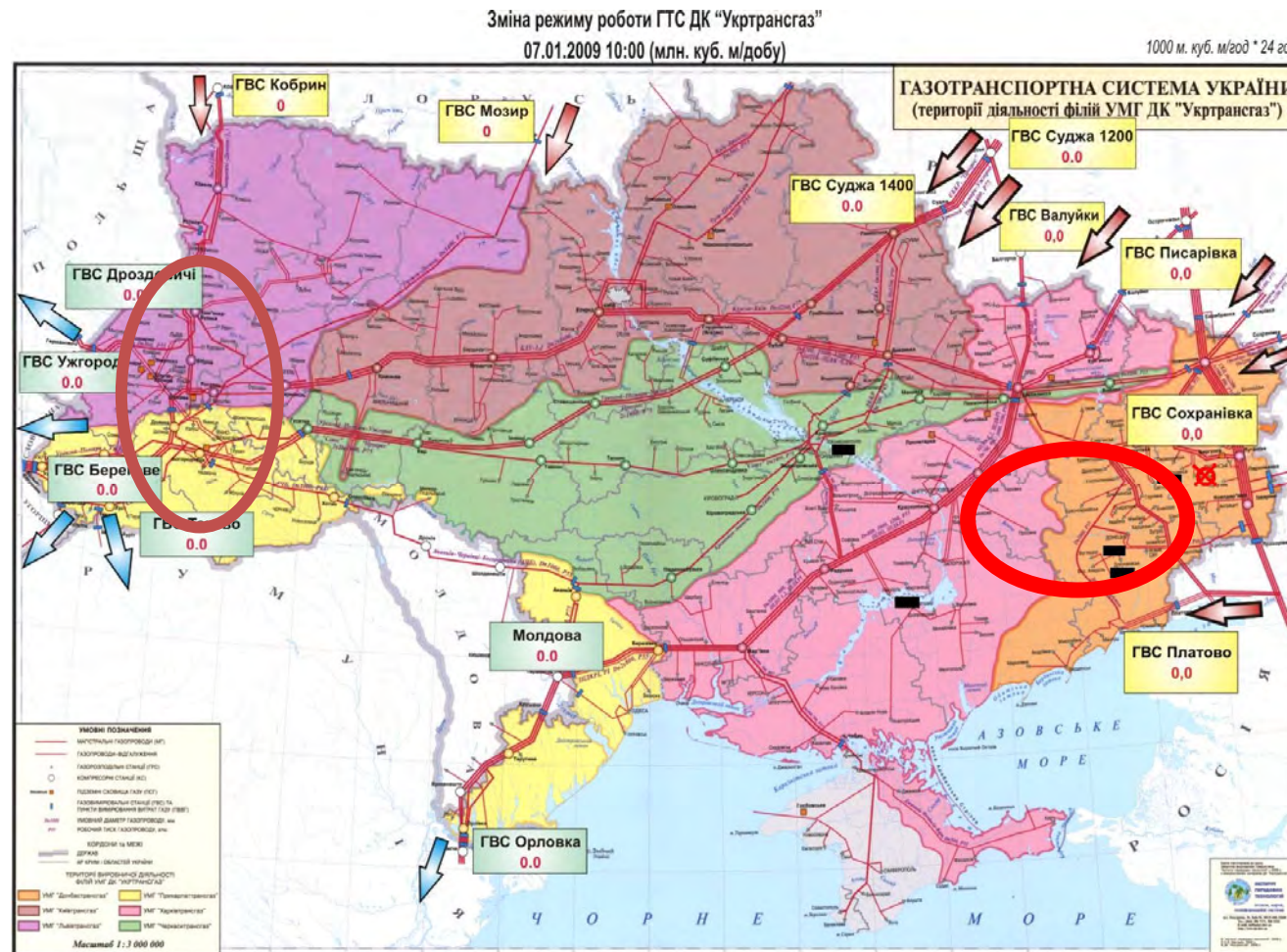
GAS PEAK DEMAND A SECURITY OF SUPPLY ISSUE

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- An estimated 28% spike in gas demand in Ukraine occurs during a 30 days period/ year (8%) due to cold weather or technical emergencies.
- During that periods, most of excessive compressors work and gas pressure fluctuations create strain on gas system and may lead to physical devastation of the network (rear event with high impact) Need scenario analysis
- At winter peak demand, Ukraine domestic gas demand approaches total gas input capacity from Russia, which means that:
- Gas supply to Europe is maintained by withdrawal from underground storages only (but with no interruption of supply)

LOCATION OF MAJOR TPPs AND DISTRICT HEATING SYSTEMS FAR FROM UNDERGROUND STORAGES

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ISSUES FOR RISK ASSESSMENT

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- Security of gas transit is assured by Ukraine underground storages (UGS) only
- Auxiliary gas consumption in gas transit system exceeds international norms
- Management and accuracy of swaps between gas supply from Russia to Ukraine and actual deliveries from Ukraine UGS to Europe are difficult to monitor
- Gas infrastructure deteriorates
- Tariffs reflecting a true cost structures?
- Estimated waste of up to 10 -20 bcm equivalent per year must be addressed

AN INTEGRATED POLICY

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- There is a need for integrated approach: gas, heat, electricity, IT, energy efficiency, demand side management ...
- Current assistance for rehabilitation and modernization of gas transit system does not include such projects, it may not produce sustainable outcomes if exposed to current circumstances
- The standard gas market reform package should be adapted to specifics of gas-heat-electricity infrastructure
- Problem is not well documented and needs further research

RECOMMENDATIONS

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- Design Emergency Prevention Strategy to eliminate gas demand hikes and reduce probability of technical failures
- Introduce the integrated (gas-heat-electricity) demand management solution in the assistance package
- Formulate regulatory and investment framework to facilitate sustainable investments into energy efficiency, electricity and heat generation,

OUTCOMES

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- A Secure and reliable gas transit via Ukraine
- Potential reduction in Ukraine peak and seasonal gas demand for up to 10bcm or more a year that could ease seasonal fluctuations in Europe
- Large part of Ukraine UGS capacity could be made available to provide additional flexibility in gas supply to Europe - seasonal flexibility
- Diversification of marketing options for gas producers